DWeb Weekend 2025 - Saturday 8/16/2025

Roundtable Discussion 1.3

Title: Federation vs P2P Tradeoffs

Time: 11:15 - 12:00

Attendees: Greg Skepak, Steven Elleman, Sri Chilum

Note taker: Steven Elleman

Please add your /initials/ at the front of a comment

General Notes

- Definitions:
  - Peer-to-peer (P2P): direct connection without intermediaries
  - Federation: Mixture of P2P and hierchical, P2P characteristics confined to "super-peers", "hub and spoke" model where super-peer talk to each other and regular peers
- Spectrum of intermediation from platform, federation, p2p
- Examples:
  - P2P:
    - Bittorrent
    - Blockchain discovery (gossip protocol)
    - P2Panda
    - Hyper Hyperspace
    - TinySSB
  - Federation:
    - Email
    - DNS

        - Shelter Protocol
        - Activitypub (e.g. Mastodon)

- P2P
    - Hardest to understand because it has hardest challenges
    - Will use chatroom as example
    - Underlying data structure:
        - Append-only log
    - A list of messages ordered chronologically
    - Ordering is much harder, chaos of peers joining and leaving the network, offline functionality, inconsistent clocks
    - Single-writer vs multi-writer logs
    - Single-writer:
        - Each peer has its own log
    - Multi-writer:
        - Peers are writing to same log
        - Produces a DAG (directed acyclic graph)
        - E.g. P2Panda
        - Is a CRDT (Conflict-free Replicated Data Type)
        - The name is a misnomer, "Conflict-ignoring" – conflict is inevitable, handled gracefully, variety of ways of deciding how to deal with conflict, but ultimately to produce a consistent history
    - Hole-punching for NAT Traversal
        - Getting around / through the federated nature of routing
    - Ideally suited:
        - Internet is down
        - Privacy / sovereignty
    - Artificial constraint on direct connection between devices, Big Tech

providers no incentivized to offer

- Federation:
  - Nice properties:
    - Consistency – single source of truth ensures a consistent history
    - Simpler
    - Super-peer can be specialized for its role for enhanced performance. "Liveness" – super-peer can always be online
    - Don't have to worry about hole-punching
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Summary to be reported to the other DWeb Weekend participants

a) Different tradeoffs and use-cases.
b) P2P for avoid setting up server, "purer" in terms of power
c) Federation simplifies challenges and allows role specialization.
d) P2P challenges are harder and the technology is farther behind than federation.

name of the reporter